LALP-02-148

Waste Minimization Using Granulation Technology

Nuclear Materials Technology Division

A granulation and material transfer system is currently being investigated as an option to reduce the amount of 239Pu-contaminated solid waste generated at the Plutonium Facility (TA-55) at Los Alamos National Laboratory (LANL). Since this waste is destined for WIPP disposal as TRU waste, this technology can significantly reduce the cost of waste packaging and disposal operations at LANL. Candidate test material for this study include ceramic, glass, rubber gloves, and plastic items consisting of bottles, tubing, and bags. In addition to evaluating the efficacy of the size reduction operation, LANL personnel are also investigating the use of a material transfer system that will allow for workers at TA-55 to operate the system in a safe and ergonomically efficient manner. The potential financial impacts for LANL in regards to storage and shipment of waste are enormous considering the increasing costs of disposal.

Figure 1

Photo of a commercial granulator

The size reduction equipment, as shown in Figure 1, consists of a commercial granulator manufactured by Rapid Granulator, Inc. A cutting blade assembly is located at the base of the unit above the black materi catch bin. This blade assembly performs the actual cutting operations and can reduce the size of the material to a nomnal diameter based on the perforations of a drop screen placed below the cutting section. An electric motor and belt drive system rotate the blades and provide the mechanism for size reduction of polymeric, glass and ceramic material. An important aspect of this granulator is the safety system. There are electrical interlocks that prevent the worker from opening and accessing the blades during operation and the hopper has been designed so the worker cannot inadvertently touch the blades. A supplemental material transfer system is added to the granulator to facilitate the placement of material into the hopper with a conveyor system and extraction of granulated material from the catch bin with a cyclone vacuum system.

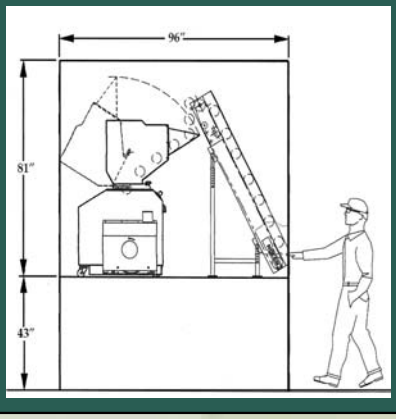

Illustration of a hopper with a conveyor system

Figure 2

Examples of material before and after granulation

Surrogate combustible wastes used in this investigation include rubber gloves, cellulose rags, and plastic material (i.e., bags, tubing, and bottles composed of high-density polyethylene (HDPE), low density polyethylene (LDPE), polyvinyl chloride (PVC), and polypropylene). Figure 2 shows examples of material before and after granulation. The efficacy of volume reduction via granulation was evaluated for 1 liter plastic bottles. Twenty-six bottles initially occupied a volume of 49.5 liters; LANL personnel granulated these bottles and determined the final volume of the granules to be 5.8 liters. Therefore, size reduction of the 1-liter bottles yielded an 88 percent reduction in waste volume.

The TRU waste inventory for the LANL Plutonium Facility for calendar years 1997, 1998, and 1999 was reviewed to determine the potential for volume reduction using granulation technology. 239 Pu-contaminated solid waste consisting of TRUCON Code 116 (combustible waste) was selected for this analysis. Results of the review indicate 259 (54,000 liters) drums were filled using only 34% of the allowable wattage limit per waste drum because the fill capacity of the drum was limited by material volume. If the 259 drums containing combustible waste had been filled to the wattage limit, a 66% reduction in volume (down to 18,000 liters) would have been achieved. If granulation technology would have been used on these drums, LANL could have saved 2-million dollars on storage and shipment costs. The results of this analysis indicate volume reduction of TRU combustible waste will reduce not only the present LANL inventory, but also the future number of TRU waste drums for WIPP disposal and provide substantial cost savings for years to come.

Contacts: Susan Ramsey, (505) 667-2025, sramsey@lanl.gov, NMT-7
Donald L. Quintana, (505) 667-4633, dlquintana@lanl.gov, ESA-AET
Fernando Roybal, (505) 667-1718, frr@lanl.gov, ESA-AET